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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/574,232	07/13/2006	Philip Fletcher	687-144	2148
23117 7590 09/05/2008 NIXON & VANDERHYE, PC 901 NORTH GLEBE ROAD, 11TH FLOOR ARLINGTON, VA 22203				
EXAMINER				
WANG, CHUN CHENG				
ART UNIT		PAPER NUMBER		
1796				
MAIL DATE		DELIVERY MODE		
09/05/2008		PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/574,232

Applicant(s)

FLETCHER ET AL.

Examiner

Chun-Cheng Wang

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Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-28, 31, 36, 38, 39, 42 and 44-50 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-28, 31, 36, 38, 39, 42 and 44-50 is/are rejected.
- 7) ☒ Claim(s) 46 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/55/06)
Paper No(s)/Mail Date 03/31/2006, 05/01/2006 and 10/30/2007.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date: ____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: ____.

DETAILED ACTION

1. Claims 1-28, 31, 36, 38-39, 42, and 44-50 are pending. Claims 29-30, 32-35, 37, 40-41 and 43 are canceled.

Claim Objections

2. Claim 46 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Applicants recite fluid flow path contains a composition which includes 40 to 80 wt % of material derived from the viscous petroleum and 20 to 60 wt % of material derived from the treatment fluid formulation. The weight ration range can be derived from the composition wt%, 20 wt%/80 wt% to 40 wt%/60 wt%, as 0.25 to 1.5. The range is broader than that of claim 45, i.e. 0.2 to 1, which claim 46 depends.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 42 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim contains phrases '(a)...with, for example absorb onto,...', '...viscous composition, especially oil, in...' and '(c)...viscous composition, especially oil' that are indefinite. A broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered indefinite, since the resulting

claim does not clearly set forth the metes and bounds of the patent protection desired. See MPEP § 2173.05(c). Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989), as to where broad language is followed by "such as" and then narrow language. The Board stated that this can render a claim indefinite by raising a question or doubt as to whether the feature introduced by such language is (a) merely exemplary of the remainder of the claim, and therefore not required, or (b) a required feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex parte Hasche*, 86 USPQ 481 (Bd. App. 1949). In the present instance, claim 42 recites the broad recitation 'associate with', and the claim also recites 'absorb onto' which is the narrower statement of the range/limitation. Claim 42 also recites the broad recitation 'viscous composition', and the claim also recites 'especially oil' which is the narrower statement of the range/limitation.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-10, 15-27, 38-39, 42 and 48-50 are rejected under 35 U.S.C. 102(b) as being anticipated by Chirinos et al. (US 5641433.)

7. Regarding claims 1 and 4: Applicants recite a method for reducing the viscosity of a viscous composition which is arranged to flow along a fluid flow path, said method comprising contacting the viscous composition with a treatment fluid formulation, said treatment fluid formulation comprising a polymeric material AA which includes --O-- moieties pendent from a polymeric backbone thereof,

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wherein polymeric material AA is optionally cross-linked (claim 1) and the viscous composition is an oil (claim 4).

8. Chirinos et al. suggest emulsifying the crude in water as one of the methods for the transportation of viscous crudes by pipeline (column 1, lines 20-32) and disclose a method for the preparation of HIPR emulsions of viscous oils in water in which emulsions are directly prepared from a feedstock initially containing a high volume ratio of oil to water using low energy mixing. Some emulsions are readily pumpable through a pipeline, others are so after dilution. The emulsions are stable following preparation, during transportation and on standing, and can resist various conditions encountered during pipeline flow such as temperature fluctuations and mechanical shearing (column 2 lines 36-49). To improve salt tolerance, hydrophilic polymers may be added in addition to the surfactant or alkali. Suitable polymers include polyvinyl alcohol, polyethylene oxide, polyvinyl pyrrolidone and polysaccharide biopolymers (column 3, lines 55-59).

9. Regarding claims 2-3 and 20: Applicants further recite the viscosity of the viscous composition after contact with the treatment fluid formulation is less than 300 cP measured at 25°C, and 1000 s⁻¹ (claim 2), the viscous composition, after contact with the treatment fluid formulation, exhibits shear thinning (claim 3) and the polymeric backbone consists essentially of carbon atoms in the form of C-C single bonds (claim 20).

Chirinos et al. disclose an HIPR emulsion of oil in water comprising 80 to 98% by volume of a viscous oil having a viscosity in the range 200 to 250,000 mPa.s (claim 1) at the room temperature (20°±2°C); and hydrophilic polymer employed is **polyvinyl alcohol**, polyethylene oxide, polyvinyl pyrrolidone or a polysaccharide biopolymer (claim 9), a **c-c backbone polymer**, to prepare oil in water emulsion. Also polyvinyl alcohol polymer solution has **shear thinning** property as evidenced by Barlow (US 3647528). One would anticipate the

oil in water emulsion with polyvinyl alcohol polymer will exhibited the same property, i.e. lower viscosity by higher shearing rate and temperature of 25°C.

10. Regarding claim 5: Applicants further recite the treatment fluid formulation is initially contacted with the viscous composition at or downstream of a production means.

11. Chirinos et al. disclose emulsions are directly prepared from a feedstock initially containing a high volume ratio of oil to water using low energy mixing. Some emulsions are readily pumpable through a pipeline; others are so after dilution (column 2, lines 36-39).

12. Regarding claims 6-8: Applicants further recite a method, wherein the fluid flow path is defined by a conduit means which includes a first conduit part which is arranged downstream of a production means (claim 6); a method according to claim 1, wherein said fluid flow path extends between a first point, remote from the point of production of the viscous composition, and a second point closer to the point of production of the viscous composition (claim 7); and wherein said fluid flow path is defined, in part, by a second conduit part which extends upwardly from below ground to above ground (claim 8).

13. Chirinos et al. disclose the preparation of emulsions by formulation mixing with oil then pump through a pipeline for further treatment (column 2, lines 36-49). The pipeline could be from an inland oilfield, reads on first point, to a coastal terminal, reads on second point, then may be to transship the oil, reads on extends upwardly from below ground to above ground, further by tankers (column 4, lines 66-67 and column 5, line 1).

14. Regarding claims 9-10: Applicants recite a method wherein said treatment fluid formulation is arranged to disperse and/or emulsify said viscous composition on contact therewith (claim 9); and wherein flow is turbulent at the point of initial contact of said viscous composition with said treatment fluid formulation so that said composition is dispersed and/or emulsified on contact with said formulation (claim 10).

15. Chirinos et al. disclose oil and water may be mixed (to form HPR emulsion) under conditions known to be suitable for mixing viscous fluids (column 4, lines 30-31), particularly suitable mixer is a vessel having rotating arms. Suitably the speed of rotation is in the range 500

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to 1,200 rpm, reads on turbulent flow. Below 500 rpm mixing is relatively ineffective and/or excessive mixing times are required (column 4, lines 35-38).

16. Regarding claims 15-16: Applicants further recite a method according to claim 1, wherein said treatment fluid formulation includes at least 70 wt% (of) water (claim 15), wherein said treatment fluid formulation includes at least 0.2 wt % and less than 10 wt % of said polymeric material AA (claim 16).

17. Chirinos et al. disclose at least 79.5% of water in the aqueous solution, i.e. treatment fluid (column 3, lines 27-64).

18. Regarding claim 17: Applicants recite a method according to claim 5, wherein said treatment fluid formulation includes 94.5 to 99.6 wt % water and 0.4 to 5.5 wt % of said polymeric material AA; and the ratio of the wt % of said treatment fluid formulation to the wt % of said viscous composition contacted in the method is in the range 0.4 to 0.9.

19.

20. Chirinos et al. disclose the preparation of an HIPR emulsion of oil in water which method comprises directly mixing 70 to 98% by volume of a viscous oil with 30 to 2% by volume of an aqueous solution of an emulsifying surfactant or an alkali (column 2, lines 64-67 and column 3, lines 1-3), which has about 0.025 to 0.5 weight ratio when convert the volume % to weight % using crude oil density of 0.79 g/cm³ and treatment fluid density of 1 g/cm³. Chirinos et al. disclose the quantity of polymer employed is preferably in the range 0.25 to 5% by weight of the aqueous solution.

21. Regarding claims 18-19 and 21: Applicants further recite a method according to claim 1, wherein said polymeric material AA is wholly soluble in water at 25 °C (claim 18), and wherein said polymeric backbone of said polymeric material AA includes carbon atoms which are part of -CH₂- moieties (claim 19); treatment fluid formulation includes a hydrogel which is an optionally cross-linked polysaccharide, polyvinylalcohol or polyvinylacetate (claim 21).

22. Chirinos et al. disclose polymers include polyvinyl alcohol, polyethylene oxide, polyvinyl pyrrolidone and polysaccharide biopolymers (column 3, lines 57-59), i.e. water-soluble polymers. The polymers have -CH₂- moieties in the backbone.

23. Regarding claims 22-24: Applicants further recite wherein said -O- moieties are directly bonded to the polymeric backbone (claim 22); wherein said polymeric material AA includes, on average, at least 10-0- moieties pendent from the polymeric backbone thereof (claim 23); wherein said polymeric material

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AA includes a moiety: where G^1 and G^2 are other parts of the polymeric backbone and G^3 is another moiety pendent from the polymeric backbone (claim 24).

24. Chirinos et al. disclose the hydrophilic polymer is polyvinyl alcohol, polyethylene oxide, polyvinyl pyrrolidone or a polysaccharide biopolymer (claim 9). Polyvinyl alcohol has at least one -O- moieties per repeating unit, i.e. more than 10 -O- moieties in polymeric material.

25. Regarding claims 25-27: Applicants further recite a method according to claim 4, wherein at least 60 mole % of the polymeric material AA comprises vinyl moieties which are optionally cross-linked (claim 25); the free bond to the oxygen atom in the -O- moiety pendent from the polymeric backbone of polymeric material AA is bonded to a group R^{10} which comprises fewer than 10 carbon atoms and only includes atoms selected from carbon, hydrogen and oxygen atoms (claim 26); and the moiety -O- R^{10} in said polymeric material AA is an hydroxyl or acetate group (claim 27).

26. Chirinos et al. disclose polyvinyl alcohol, in which -O- R^{10} is -OH and has greater than 60 mole% of vinyl moieties, as the polymeric material in the emulsion (claim 9).

27. Regarding claims 38-39: Applicants further recite wherein after the viscous composition has been delivered to a desired location the viscous composition is caused to separate from other components of the treatment fluid formulation (claim 38); and wherein separation is achieved by reducing mixing or turbulent movement of the mixture and allowing the viscous composition to settle out from the water and optionally cross-linked polymeric material AA (claim 39).

28. Chirinos et al. disclose the oil in water emulsion can be broken when desired by using appropriate treatment, for example treatment with an alcohol or a salt (column 2, lines 47-49), (then allow oil to settle out by reducing or not mixing).

29. Regarding claim 42: Applicants recite a method of reducing the viscosity of a viscous composition which is arranged to flow along a fluid flow path, said method comprising contacting the viscous composition with a treatment fluid formulation, said treatment fluid formulation includes a polymeric material which: (a) is arranged to associate with, for example absorb onto, said viscous composition, especially oil, in order to enable droplets of said viscous composition to be formed and/or stabilised; and/or (b) is arranged to form a coating (which may be discontinuous) around droplets of said viscous composition; (c) is arranged to form a hydrogel which is able to stabilise droplets of said viscous composition, especially oil.

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30. Chirinos et al. disclose an HIPR (high internal phase ratio) emulsion of oil in water is prepared by directly mixing, i.e. contacting to associate with the viscous composition with a treatment fluid formulation, 70 to 98% by volume of a viscous oil having a viscosity in the range 200 to 250,000 mPa.s at the mixing temperature with 30 to 2% by volume of an aqueous solution, i.e. treatment fluid formulation comprising polyvinyl alcohol hydrogel, of an emulsifying surfactant or an alkali, percentages being expressed as percentages by volume of the total mixture. Mixing is effected under low shear conditions in the range 10 to 1,000 reciprocal seconds in such manner that an emulsion is formed comprising highly distorted oil droplets having mean droplet diameters in the range 2 to 50 micron separated by thin interfacial films, i.e. reads on coating. The emulsions are much less viscous than the oils from which they are prepared and may, optionally after dilution, be pumped through a pipeline (Abstract).

31. Regarding claims 48 and 49: Applicants recite a fluid flow path which contains a fluid comprising petroleum, water and a polymeric material AA which is a polyvinyl alcohol polymer or copolymer (claim 48), and fluid flow path containing a composition which includes 40 to 80 wt % of material derived from a viscous petroleum and 20 to 60 wt % of water (claim 49).

32. Chirinos et al. disclose an HIPR (high internal phase ratio) emulsion of oil in water is prepared by directly mixing 70 to 98% by volume of viscous oil with 30 to 2% by volume of an aqueous solution, i.e. treatment fluid formulation comprising hydrophilic polymer. The emulsion can be pumped through a pipeline (Abstract). Suitable polymers include polyvinyl alcohol, polyethylene oxide, polyvinyl pyrrolidone and polysaccharide biopolymers (column 3, lines 56-58).

33. Regarding claim 50: Applicants recite a fluid flow path according to claim 49, said path extending between a first point, remote from a point of production of viscous petroleum and a second adjacent to the point of production of viscous petroleum.

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34. Chirinos et al. disclose the o/w emulsion can be pumped through a pipeline from an oil field to a coastal terminal (column 4, lines 66-67).

Claim Rejections - 35 USC § 103

35. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
36. Claims 11-12 and 44-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chirinos et al. (US 5641433).

The disclosure of Chirinos et al. is adequately set forth above and is incorporated herein by reference.

37. Regarding claims 11-12 and 44: Applicants recite a method according to claim 1, wherein a delivery flow path is defined which is arranged to communicate with said fluid flow path wherein said treatment fluid formulation is dosed into said viscous composition in said fluid flow path via said delivery flow path (claim 11), and wherein the ratio of the flow rate (in weight per unit time) of treatment fluid formulation in said delivery flow path to the flow rate (in the same units) of viscous composition in said fluid flow path is in the range 0.1 to 2.5 (claim 12); and a method of reducing the viscosity of a viscous petroleum which is arranged to flow along a fluid flow path, said method comprising contacting the viscous petroleum with a treatment fluid formulation, wherein: a delivery flow path is defined which is arranged to communicate with said fluid flow path, said treatment fluid

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formulation being dosed into said viscous petroleum in said fluid flow path via said delivery flow path (which has the same limitations of claim 11); the ratio of the flow ratio (in weight per unit time) of treatment fluid formulation in said delivery flow path to the flow rate (in the same weight per unit time units) of viscous petroleum in said fluid flow path is in the range 0.1 to 2.5 (which has the same limitations of claim 12); said treatment fluid formulation includes at least 90 wt % water and at least 0.2 wt % of a polymeric material AA (which has same limitations of claim 17); said polymeric material AA is a polyvinylalcohol polymer or copolymer (claim 44).

38. Chirinos et al. disclose the mixing weight ratio is in the range of 0.11 (10 g of aqueous solution/90 g of oil), which reads on claims 12 and 44, (column 5, Examples) to form the o/w emulsion. Chirinos et al. disclose polyvinyl alcohol as one of salt tolerant hydrophilic polymer (column 3, lines 60-62). Chirinos et al. is silent on the delivery flow path which is arranged to communicate with the fluid flow path.

39. Regarding claims 45-46: Applicants further recite a method according to claim 44, wherein: said ratio of said flow rates is in the range 0.2 to 1; said treatment fluid formulation includes at least 0.5 wt % and less than 5.5 wt % of said polymeric material AA (claim 45), wherein immediately after contact between said viscous petroleum and said treatment fluid formulation, said fluid flow path contains a composition which includes 40 to 80 wt % of material derived from said viscous petroleum and 20 to 60 wt % of material derived from said treatment fluid formulation (claim 46)

40. Chirinos et al. disclose an emulsifier composition of 97.5 wt% water, 1.25 wt% of polyisobutene sulphonate and 1.25 wt% of polyvinyl pyrrolidone, which reads on claims 45, (column 7, Table 2, item 32). The HIPR (high internal phase ratio) emulsion of oil in water is prepared by directly mixing 70 to 98% by volume of viscous oil with 30 to 2% by volume of an aqueous solution of an emulsifying surfactant or an alkali (Abstract). The emulsifier comprises mostly water (density close to 1 g/cm³) and the viscous oil is less dense (density in the range of 0.7- 0.9 g/cm³). The o/w emulsion composition would have higher wt% range than its volume % and the oil would have lower wt% than its volume % when using densities to convert volume % to weight %. The wt% range overlap with the claimed range.

41. Chirinos et al. meet all the limitations in claims 11-12 and 44-46, except it is silent on the delivery flow path which is arranged to communicate with the fluid flow path.

The volume or content of crude oil could vary during oil extraction operation. The amount of emulsifier and water added to oil will need to be adjusted accordingly to have desired viscosity to transport oil. It is necessary to 'communicate' the two input sources, oil and treatment fluid flows, via mechanical or electronic methods to control the treatment fluid flow rate. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains to add necessary communication between the oil and treatment fluid control mechanism to obtain desired viscosity reduction to transport crude oil.

42. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chirinos et al. (US 5641433).

43. Applicants further recite wherein the amount of water in the composition in said fluid flow path immediately after contact between said viscous composition and said treatment fluid formulation is less than 70 wt %.

44. Chirinos et al. disclose the preparation of an HIPR emulsion of oil in water which comprises direct mixing 70 to 98% by volume of a viscous oil with 30 to 2% by volume of an aqueous solution of an emulsifying surfactant or an alkali (column 2, lines 64-67 and column 3, lines 1-3). The emulsion has less than about 30 wt% of water coming from the emulsifier aqueous solution and a small amount from the viscous oil, when convert the volume % to weight % using crude oil density of 0.8 g/cm³. **The more the amount of water in the emulsion, the less viscous the oil. But it is less efficient transporting the oil.** It would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject

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matter pertains to optimize between lower viscosity and efficiency of the operation to obtain the claimed less than 70 wt% of water in the emulsion of the viscous composition and the treatment fluid formulation.

45. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chirinos et al. (US 5641433).

46. Applicants recite a method according to claim 1, wherein said treatment fluid formulation has a viscosity at 25°C and 1000 s⁻¹ of greater than 1 cP and not greater than 50 cP.

47. Chirinos et al. is silent on the viscosity of the treatment fluid formulation.

48. Water is the solvent of the treatment fluid and the major portion of the fluid. Water has a viscosity of 1.0020 cP at 20°C, which is lower than that of oil. **Higher water content and mixing rate, will lower the treatment fluid viscosity.** It would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains to do routine experiment adjust the composition of water and polymer to obtain the claimed viscosity of the treatment fluid formulation.

49. Claims 28 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chirinos et al. (US 5641433) in view of Hoskin et al. (US4896723).

50. Regarding claims 28 and 31: Applicants recite a method A method according to claim 1, which involves selecting a said polymeric material AA; selecting a material BB which includes a functional group which is able to react in the presence of said polymeric material AA to cross-link polymeric material AA and form a polymeric material CC; and causing the formation of said polymeric material CC by a reaction involving said polymeric material AA and material BB (claim 28), wherein material BB has

a general formula: $\begin{array}{c} \text{CHO} \\ | \\ \text{G}^5 \end{array}$ where G⁵ represents a direct link or a linking moiety (claim 31).

51. Chirinos et al. is silent on the cross linking of the polymer.

52. Hoskin et al. disclose a cross-linked polymer (reads on general formula of polymeric material CC) is obtained by cross-linking polyvinyl alcohol with a cross-linking agent which is a mixture of a phenolic component and an aldehyde or a mixture of a naphtholic component and an aldehyde. The resulting polymer is exceptionally thermally stable and, therefore, can be used as an effective permeability control agent in all enhanced oil recovery operations, including steam flooding (Abstract). Any suitable water-dispersible aldehyde can be used. Thus, under proper conditions of use, both aliphatic and aromatic monoaldehydes, and also dialdehydes (reads on general formula of polymeric material BB), can be used. Representative examples of such aldehydes include formaldehyde, paraformaldehyde, acetaldehyde, propionaldehyde, butyraldehyde, isobutyraldehyde, valeraldehyde, heptaldehyde and decanal. Representative examples of dialdehydes include glyoxal, glutaraldehyde and terephthaldehyde (column 4, lines 61-68 and column 5, lines 1-4). The cross-linked polymer compositions have a **gelled consistency and they are very stable even under the extreme conditions of temperature encountered in steam flooding of underground formations** (column 6, lines 34-38). It would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains to take advantage of the teaching from Hoskin et al. and use it in the transportation of oil.
53. Claim 47 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chirinos et al. (US 5641433) in view of Hoskin et al. (US4896723).
54. Applicants recite a method according to claim 46, wherein said polymeric material AA comprises polyvinylacetate which has been 60 to 90% hydrolysed to polyvinylalcohol.

Chirinos et al. is silent on the hydrolysis of the polyvinyl alcohol.

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55. Hoskin et al. disclose if PVA having a lower degree of hydrolysis is used, e.g., about 85 to about 95% hydrolysis, the relative proportion thereof used in the synthesis is about 2.5 to about 7.5%. Conversely, if PVA having a higher degree of hydrolysis is used, e.g., about 95 to about 99% hydrolysis, lower amounts of PVA are used to produce a gel more resistant to syneresis. At such **high degrees of PVA hydrolysis, higher amounts of PVA produce gels unduly susceptible to syneresis**. Thus, for PVA having such a high degree of hydrolysis, the amount of PVA used is about 1 to about 3.0 (column 5, lines 35-44). It would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains to optimize the degree of hydrolysis and the amount of PVA used to obtain the claimed 60 to 90% hydrolysed PVA in the treatment fluid formulation.

56. Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chirinos et al. (US 5641433) in view of England et al. (US2002/0128374 A1).

57. Applicants recite a method according to claim 28, wherein said material BB comprises: (i) a first



polymeric material having a repeat unit of formula $\left[\text{C}(\text{A})(\text{B})\text{C}(\text{R}^1)(\text{R}^2) \right]_n$ wherein A and B are the same or different, are selected from optionally-substituted aromatic and heteroaromatic groups and at least one comprises a relatively polar atom or group and R^1 and R^2 independently comprise relatively non-polar atoms or groups; or (ii) a first polymeric material prepared or preparable by providing a compound of

general formula $\text{B}-\text{C}(\text{R}^1)=\text{C}(\text{R}^2)-\text{A}$ wherein A, B, R^1 and R^2 are as described above, in an aqueous solvent and causing the groups $\text{C}=\text{C}$ in said compound to react with one another to form said first polymeric material.

Chirinos et al. is silent on the cross linker BB of the polymer.

58. England et al. disclose a method of preparing a first polymeric compound which



comprises providing a compound of the general formula $\text{B}-\text{C}(\text{R}^2)=\text{C}(\text{A})-\text{R}^1$ or a salt thereof where A and B are the same or different and at least one group comprises a relatively polar atom or group

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and R^1 and R^2 independently comprise relatively non-polar atoms or groups, in a solvent of a type in which ethane itself is greatly insoluble and spacing the $C \equiv C$ groups in said compound to react with one another to form a polymeric structure. The first polymeric compound may be reacted with a second compound (reads on crosslinking), for example **polyvinylalcohol**, collagen, or the like to produce a colloid or gel which may have applications in the treatment of burns or **recovery of oils** (Abstract). England et al. also disclose a second aspect of the present

invention, there is provided a novel first polymeric compound having the formula



wherein A, B, R^1 and R^2 are as described in any statement herein and n is an integer ([0026] – [0027]). According to a third aspect, there is provided a method of preparing a formulation comprising providing a first polymeric compound according to said first or second aspects in a solvent together with a second polymeric compound and intimately mixing the compounds [0028]. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains to utilize the teaching from England et al. to prepare the polymeric material BB, crosslink polyvinyl alcohol and use in transportation of oil.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chun-Cheng Wang whose telephone number is (571)270-5459. The examiner can normally be reached on Monday to Friday w/alternate Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Larry Tarazano can be reached on 571-272-1515. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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